***What is digital competence?***

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During recent years, *digital competence* has become a key concept in the discussion of what kind of skills and understanding people should have in the knowledge society. It is a political concept, reflecting beliefs and even wishes about future needs, and has its roots in the economical competition in which the new technologies are regarded as an opportunity and a solution.

Digital competence is the most recent concept describing technology-related skills. In recent years, several terms have been used to describe the skills and competence of using digital technologies, such as ICT skills, technology skills, information technology skills, information literacy, digital literacy, 21th century skills, and digital skills. These terms are also often used as synonyms; e.g. digital competence and digital literacy. Sometimes the terms are narrow, e.g., Internet skills, referring only to a limited area of digital technology, and some of them extend the scope to media and literacy, e.g., media literacy skills or digital literacy. The wide variety of terms reflects the rapid development of technologies but also different areas of interest, such as library studies or computer science. Moreover, changes in society and culture, based on new technology, have effects on terms. It is expected that the content and the scope will still change, and that is even expected to be: it is recommended that the approaches should be dynamic and regularly revised because of evolving new technologies and their use in society.

There is not yet any general, research-based acceptance and justification of the concepts concerning digital competence. This lack of theoretical justification results to different definitions that ignore the full range of skills and focus only on some limited skills, e.g., for practical purposes of educators and designers. In addition, *digital competence* is policy-related, sometimes used in a normative way, representing goals to be achieved.

In recent publications, the term *competence* is more used than *skills*, reflecting the need for a wider and more profound content of the concepts. The relation between *competence* and *skills* is defined in an OECD project as follows: “A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context.”

In the widest and most recent definitions, based on policy-related papers and reports, digital competence consists not only of digital skills but also social and emotional aspects for using and understanding digital device. The European Commission has defined digital competence as involving the confident and critical use of Information Society Technology for work, leisure and communication. Digital competence is grounded on basic skills in ICT, i.e. the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.

***Digital competence and its connection to general competences***

OECD launched a project which provides a framework for guiding the longer-term extension of assessments into new competency domains. In the project, the key competencies for a successful life and a well-functioning society are classified in three broad categories:

1) Use tools interactively,

2) Interact in heterogeneous groups, and

3) Act autonomously.

Each of these key competencies implies the mobilization of knowledge, cognitive and practical skills, as well as social and behavioural components including attitudes, emotions, values, and motivations. The underlying part of the framework is reflective thought and action. Thinking reflectively demands relatively complex mental processes and requires the subject of thought process to become its object; reflectiveness implies the use of meta-cognitive skills, creative abilities and taking a critical stance.

The first key competence, Use tools interactively, is close to digital competences. It means the ability to use technology with other people for communication, for working, for playing etc., which requires an awareness of new ways in which an individual can use technologies in his/her daily life. An individual should have the ability to make use of the potential of ICT to transfer the way of working, to access information, and to interact with others. In the report, the key competence is divided to the following sub-competencies:

1) Use language, symbols and texts interactively: the effective use of spoken and written language skills, computation and mathematical skills, in multiple situations.

2) Use knowledge and information interactively: requires to

- recognise and determine what is not known

- identify, locate and access appropriate information sources

- evaluate the quality, appropriateness and value of that information, as well as its sources; and

- organise knowledge and information

3) Use technology interactively requires awareness of new ways in which individuals can use technologies in their daily life; to use the potential of ICT to transform the ways of working together, accessing information and interacting with each other. We have to go beyond the basic technical skills that are needed only to use the Internet, send e-mails and so on.

The European has created a framework for key competences for lifelong learning in a knowledge society, in which eight key competences are identified and defined. These are

1. communication in the mother tongue;

2. communication in foreign languages;

3. mathematical competence and basic competences in science and technology;

4. digital competence;

5. learning to learn;

6. social and civic competences;

7. sense of initiative and entrepreneurship;

8. cultural awareness and expression.

***Examples of related concepts***

*1. Digital literacy*

An example of a concept used close to digital competence and often as a synonym is *digital literacy.* The elaboration of this concept is connected both to traditional literacy as well as to media studies. An example of such a definition is the following: Digital literacy represents a person’s ability to perform tasks effectively in a digital environment; *digital* means information represented in numeric form and primarily use by a computer, and *literacy* includes the ability to read and interpret media, to reproduce data and images through digital manipulation and to evaluate and apply new knowledge gained from digital environments. The concept is also used to describe our engagements with digital technologies as they mediate many of our social interactions.

There are several approaches to digital literacy, and several ways of defining the concept; even increasing fuzziness of the concepts *text* and *literacy*. The change of printed text to digital “texts” is a profound change also concerning participation in the open and interactive literacy culture. It is typical to see digital literacy in a wide and general way; for example, as “skills, knowledge and attitudes in using digital media to be able to master the challenges in the learning society”. Another broad meaning is that digital literacy consists of five major digital skills: photo-visual skills (“reading” instructions from graphical displays), reproduction skills (utilizing digital reproduction to create new, meaningful materials from existing ones), branching skills (constructing knowledge from non-linear, hypertextual navigation), information skills (evaluating the quality and validity of information), socio-emotional skills (understanding the “rules” that prevail in cyberspace and applying this understanding in online cyberspace communication, and real-time thinking skill (the ability to process and evaluate large volumes of information in real time).

Another way of defining the concept is to broaden the traditional concept of literacy and investigate what kind of new features digitalism brings to the content of literacy. In those definitions it is typical to place written presentation at the heart of any definition of digital literacy, mediated by new technology. An addition to digital literacy is *critical digital literacy* which emphasizes the responsibility to provide the young with tools and understanding to interpret the constructed nature of popular culture and to investigate it critically. It is obvious that good digital skills are based on such academic skills as reading and writing. Several researchers emphasize that digital literacy should not be about replacing existing literacies: reading, writing and numeracy are crucial skills for full participation in a digital society. However, the content and the scope of basic digital skills needs to be changed.

*2. Literacy skills for the twenty-first century*

Close to *digital competence* (or skills) are *literacy skills for the twenty-first century*, sometimes also the term *21-century skills* is used*.* These skills are defined to enable participation in the new communities emerging within a networked society. According to one definition, these consist of:

* play (the capacity to experiment with the surroundings as a form of problem-solving),
* performance (the ability to adopt alternative identities for the purpose of improvisation and discovery)
* simulation (the ability to interpret and construct dynamic models of real world processes)
* appropriation (the ability to meaningfully sample and remix media content)
* multitasking (the ability to scan one’s environment and shift focus)
* distributed cognition (the ability to interact meaningfully with tools that expand mental capacities)
* collective intelligence (the ability to pool knowledge and compare notes with others toward a common goal)
* judgment (the ability to evaluate the reliability and credibility of different information sources)
* transmedia navigation (the ability to follow the flow of stories and information across multiple modalities
* networking (the ability to search for, synthetisize and disseminate information
* negotiation (the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms).

***Digital competence and the related concepts***

Figure 1 below is a general overview, and our interpretation, about the various background disciplines and the related concepts of digital competence. Many of the concepts could be replaced also differently and most important is to see the connection of the background disciplines and *digital competence.* The concept, 21st century skills / competence is as a matter of fact quite close to digital competence, and its background is similar, probably somewhat wider than digital competence. We replaced it here, however, because it exists so often in almost same meaning as digital competence.

Concepts which have their origin in computer science and in technology in general, emphasize technology-related concepts. These concepts have been used widely also among educators, both researchers and practitioners as well as policy makers. Concepts related to library science have emphasized the information searching skills. These skills have become more popular also among educators because of the complexity of information in the Internet. Literacy studies have raised the idea of new forms of literature based on digital technologies. Media studies and media education have connected the digital skills to media literacy.

Fig. 1 Digital competence, background disciplines and the related concepts

***Investigating digital competence***

One reason for the missing definition of digital competence is the limited amount of studies that measure the digital competence (or digital skills). The studies are often limited in their definitions, sample sizes and methods of data collection. This means that there is not enough empirical data to validate the structures and the content of digital competences or skills.

***Practical work for defining necessary digital competencies***

There appears to be a common and wide interest in trying to define the necessary competencies for the future; various institutions, consortia and national policy makers have projects aiming to define the competences either in a general sense or for a chosen group, such as teachers or students. See, e.g., the following sources:

* UNESCO (2010) has a project about ICT Competency Standards for Teachers. The competencies consist of four components: Policy and vision, Technology literacy, Knowledge deepening, and Knowledge creation, and each of them, several topics.
* International Society for Technology in Education has defined the educational technology standards for students. The main competencies are creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship, and technology operations and concepts.

The Assessment and Teaching of 21st Century Skills -project was created by Cisco, Intel and Microsoft and launched 2009. In this project, the focus was in the new ways and methods for assessment and teaching. The skills in the paper (referred as 21st century skills) were grouped to four main categories listed in Table 1. ‘Tools for working’ was the group which mainly focused on digital skills.

Table 1. The main categories of 21st skills, based on The Assessment and Teaching of 21 st Century Skills –project

|  |  |  |  |
| --- | --- | --- | --- |
| I Ways of Thinking | II Ways of Working | III Tools for Working | IV Living in the World |
| 1. Creativity and innovation | 4. Communication | 6. Information literacy | 8. Citizenship – local and global |
| 2. Critical thinking, problem solving, decision making | 5. Collaboration (teamwork) | 7. ICT literacy | 9. Life and career |
| 3. Learning to learn, Metacognition |  |  | 10. Personal & social responsibi-  lity – including cultural awareness and competence |

***Summary***

*Digital competence* is an evolving concept related to the development of technology as well as the political aims and expectations for citizenship in a knowledge society. It consists of a variety of skills and competences, and its scope is wide, covering media and communication, technology and computing, literacy, and information science. As an interpretation and summary of connecting the different approaches, we suggest that digital competence consists of 1) technical skills to use digital technologies, 2) abilities to use digital technologies in a meaningful way for working, studying and for everyday life in general in various activities, 3) abilities to critically evaluate the digital technologies, and 4) motivation to participate in the digital culture. Digital competence is regarded as a core competence in policy papers; in research, however, it is not yet a standardized concept. Several policy- or practice-related projects are currently working for finding a common and acceptable definition.